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Quiz 6: Section 6.1

1. Consider the power series $\sum_{n=1}^{\infty} \frac{4^n x^n}{n!}$. Find the Radius of Convergence and the Interval of Convergence of this series.

RATIO TEST

$$\lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right|$$

$$\lim_{n\to\infty} \left| \frac{\frac{4^{n+1} x^{n+1}}{(n+1)!}}{\frac{4^n x^n}{n!}} \right|$$

$$\lim_{n\to\infty} \left| \frac{4^{n+1} x^{n+1}}{(n+1)!} \cdot \frac{n!}{4^n x^n} \right|$$

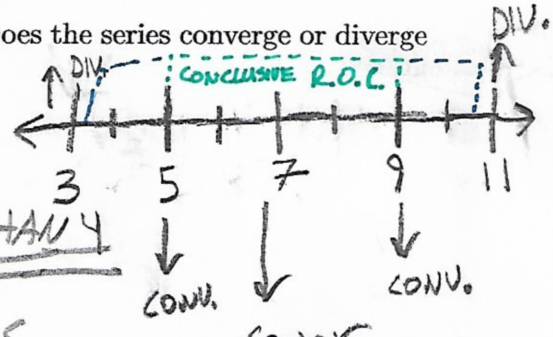
$$\lim_{n\to\infty} \frac{\cancel{4^n} \cdot 4^1 \cdot \cancel{x^n} \cdot x^1}{\cancel{n!}\, n+1} \cdot \frac{\cancel{n!}}{\cancel{4^n x^n}}$$

$$\lim_{n\to\infty} \frac{4x}{n+1} = \emptyset$$

$$\boxed{\begin{aligned} I &= (-\infty, \infty) \\ R &= \infty \end{aligned}}$$

Centered at $x=7$

2. Suppose you are given a power series $\sum_{n=0}^{\infty} c_n (x-7)^n$ for some coefficients c_n and you are told that the series converges at $x = 9$ and diverges at $x = 11$. Does the series converge or diverge at $x = 6$? Justify your answer.



We know the radius of conv. is AT LEAST 2 and LESS THAN 4

Since $X = 9$ Converges and $X=11$ diverges

so, $X=5$ and $X=6$ is in the radius of convergence so $X=6$ also converges

$\boxed{X = 6 \text{ converges because it is within the radius of convergence}}$